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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 300-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533			EXAMINER DHINGRA, RAKESH KUMAR	
			ART UNIT 1763	PAPER NUMBER
DATE MAILED: 07/24/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/729,553

Applicant(s)

ALLEN ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 19 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 5/15/06 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### **Claim Rejections - 35 USC § 112**

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1) Claim 20 recites the limitation "An apparatus according to claim 8" in line 1. There is insufficient antecedent basis for this limitation in the claim, since claim 8 is a cancelled claim. For the purpose of examination, this limitation has been interpreted as

"An apparatus according to claim 1".

2) Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention as explained hereunder.

Claim 20 recites in part "wherein the strength of the magnetic field is higher than 200G, the strength of the magnetic field reflect the plasma away from the edges of the wafer" whereas as per specification (page 7, lines 15-30), magnetic field intensity required to deflect electrons away from the edge of wafer is 13.7G. Therefore for the purpose of examination on merits, this limitation has been interpreted as "wherein the strength of the magnetic field is 13.7G or higher, which is required to reflect the plasma away from the edges of the wafer".

### **Response to Arguments**

Applicant's arguments filed 5/15/06 have been fully considered but they are not persuasive as explained hereunder.

Claims 1-4 and 6 rejected under 35 U.S.C. § 102(b) as being anticipated by

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Imafuku (U.S.P. 6,074,518)

Applicant argues that Imafuku excludes any magnetic field protection of any processing area/wafer, whereas present application teaches to selectively apply magnetic reflection to the edges of the wafer to prevent damage/polymer formation, which is a distinguishing feature that teaches away from the cited prior art. Applicant also argues that Imafuku teaches use of two magnetic rings of magnets, whereas the present invention requires only one. Applicant further argues that Imafuku prohibits magnetic field reflection in the wafer region which is a key teaching of applicant. Applicant also contends that Imafuku teaches use of lower field strength compared to the present application. Applicant finally contends that in view of above that Imafuku teaches away from the invention of present application and therefore the rejection should be withdrawn.

Examiner responds that Imafuku teaches all the structural limitations of claim 1 that is, wafer disposed on a wafer holder and an annular structure including an embedded magnet where the structure is concentric with wafer holder. Remaining limitations in the claim that, is the embedded magnet generating a magnetic field for deflecting charged particles incident on the structure and reducing plasma density in selected regions during plasma etching, thereby preventing damage to the structure by said particles and eliminating plasma from being present at edge of the wafer, pertain to functions of the magnet, for which no corresponding special structural features are recited in the claim. The above functional limitations of the magnetic field generating means are known in the art and the magnet system of prior art (Imafuku) would be capable of performing

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these functions. Accordingly rejections of claims 1-4 and 6 under 35 USC 102 (b) is maintained.

Claims 1-7 rejected under 35 U.S.C. 102(b) as being anticipated by Seta (JP 2000-036486).

Applicant argues that Seta teaches the formation of fixed magnetic fields to enhance plasma density at the edge of the wafer during deposition, whereas present application teaches reflections (i.e., reduction) of the plasma density in the region during plasma etching, and the orientation of the magnetic fields is diametrically the opposite of the orientation taught by applicants, in addition to the strength of the applied magnetic field. Applicant further argues that Seta's teaching is directed to the plasma density increasing at the edges of the wafer, whereas as per present application there will be no plasma at the edges of the wafer, as recited in amended claim 1.

Applicant also argues that while present application teaches an embedded magnet which applied field is axisymmetric, Seta's magnetic field is not and also Seta's magnetic field strength varies from 0 - 80 G as against 200G taught in the present application and Seta teaches how to enhance plasma density at the edge of wafer instead of reflecting plasma away from the edge as taught by applicant. Applicant finally contends that in view of above, the rejection should be withdrawn.

Examiner responds that Seta teaches all the structural limitations of claim 1 that is, wafer disposed on a wafer holder and an annular structure including an embedded magnet where the structure is concentric with wafer holder. Also, in the present application, as per specification (page 7, lines 15-30), magnetic field intensity required

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to deflect electrons away from the edge of wafer is 13.7G as against 0-80G taught by Seta. Remaining limitations in the claim that, is the embedded magnet generating a magnetic field for deflecting charged particles incident on the structure and reducing plasma density in selected regions during plasma etching, thereby preventing damage to the structure by said particles and eliminating plasma from being present at edge of the wafer, pertain to functions of the magnet, for which no corresponding special structural features are recited in the claim. The above functional limitations of the magnetic field generating means are known in the art and the magnet system of prior art (Seta) would be capable of performing these functions. Accordingly rejections of claims 1-7 under 35 USC 102 (b) is maintained.

Claims 5 and 7 rejected under 35 U.S.C. j 103(a) as being unpatentable over Imafuku (USP 6,074,518) in view of Seta (JP 2000-036486).

Applicant argues that the combination of Imafuku and Seta teaches an apparatus according to claim 1 wherein the magnet is an electromagnet, a teaching not found in Imafuku. Applicant also argues that, the combination of the two cited references teaches away from the present invention due to reduction of the plasma density in a selected region during plasma etching and thus orientation of the magnetic fields and strength is diametrically opposite to that of present invention. Thus, the rejection of claims 5 and 7 should be withdrawn.

Examiner responds that use of electromagnet and permanent magnets interchangeably is known in the art and Seta teaches use of both electromagnet and permanent magnet

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in his apparatus (paragraphs 0024- 0027, 0041). Further, as explained above, both Imafuku and Seta teach structural limitations of claim 1 (the parent claim).

Accordingly rejection of claims 5, 7 under 35 USC 103 (a) is maintained.

Claims 19, 20 are rejected under 35 USC 102 (b) as explained below.

### **Claim Rejections - 35 USC § 102**

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1-4, 6, 19 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Imafuku (US 6,074,518).**

With respect to Claim 1: Imafuku discloses an apparatus for plasma processing of a wafer (Fig. 12), the wafer being disposed on a wafer holder during processing (Fig 12 Item 5, Column 12 Lines 27-39), the apparatus comprising: an annular structure (Fig 12 Item 73, Column 12 Lines 27-39) including a magnet (Fig 12 Item 74, Column 12 Lines 27-39), the structure concentric with the wafer holder (Fig 12 Item 73, Column 12 Lines 27-39), the magnet generating a magnetic field for deflecting charged particles incident on the structure, thereby preventing damage to the structure by said particles.

Remaining limitations in the claim that, is the embedded magnet generating a magnetic field for deflecting charged particles incident on the structure and reducing plasma density in selected regions during plasma etching, thereby preventing damage to the structure by said particles and eliminating plasma from being present at edge of the wafer, pertain to functions of the magnet, for which no special structural limitations are recited in the claim. The above functional limitations of the magnetic field generating

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means are known in the art and the magnet system of prior art (Imafuku) would be capable of performing these functions (Column 12 Lines 40-47).

With respect to Claim 2: Imafuku discloses the magnet comprises a magnetic material embedded in said structure (Fig 12 Item 74, Column 12 Lines 27-39).

With respect to Claim 3: Imafuku discloses the structure is characterized as a ring (Fig 12 Item 73, Column 12 Lines 27-39), the ring having a groove formed therein, and the magnet is disposed in the groove (Fig 12 Item 74, Column 12 Lines 27-39).

With respect to Claim 4: Imafuku discloses the magnet is a permanent magnet (Fig 12 Item 74, Column 12 Lines 27-39).

With respect to Claim 6: Imafuku discloses that the said structure is capable of being a material susceptible to erosion during the plasma processing, so that the magnetic field reduces said erosion (Column 12 Lines 27-47).

With respect to Claim 19: Imafuku et al teach that magnetic field is axisymmetric (Figure 12 and column 12, lines 25-50).

With respect to Claim 20: Imafuku teaches that strength of magnetic field required is 10G, which anticipated the claimed field strength of 13.75G or higher (column 12, lines 45-55).

**Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Seta (JP 2000-036486).**

With respect to Claim 1: Seta discloses an apparatus for plasma processing of a wafer (Drawing 1), the wafer being disposed on a wafer holder during processing (Drawing 1 Item 3, Paragraph 21-22), the apparatus comprising: an annular structure (Drawing 1



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Item 21, Paragraph 21-22) including an embedded magnet (Drawing 1 Item 21, Paragraph 21-22), the structure concentric with the wafer holder (Drawing 1 Item 3, Paragraph 21-22), the embedded magnet generating a magnetic field. Remaining limitations in the claim that, is the embedded magnet generating a magnetic field for deflecting charged particles incident on the structure and reducing plasma density in selected regions during plasma etching, thereby preventing damage to the structure by said particles and eliminating plasma from being present at edge of the wafer, pertain to functions of the magnet, for which no special structural limitations are recited in the claim. The above functional limitations of the magnetic field generating means are known in the art and the magnet system of prior art (Seta) would be capable of performing these functions (Paragraph 21-22).

With respect to Claim 2: Seta discloses the magnet comprises a magnetic material embedded in said structure (Drawing 1 Item 21, Paragraph 21-22).

With respect to Claim 3: Seta discloses the structure is characterized as a ring (Drawing 1 Item 21, Paragraph 21-22), the ring having a groove formed therein (Drawing 1 Item 2, Paragraph 21-22), and the magnet is disposed in the groove (Drawing 1 Item 21, Paragraph 21-22).

With respect to Claim 4: Seta discloses the magnet is a permanent magnet (Drawing 6 Item 91, Paragraph 27).

With respect to Claim 5: Seta discloses that the magnet is an electromagnet (Drawing 1 Item 21, Paragraph 21-22).

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With respect to Claim 6: Seta discloses that the said structure is capable of being a material susceptible to erosion during the plasma processing, so that the magnetic field reduces said erosion (Paragraph 21-22).

With respect to Claim 7: Seta discloses that the structure consists of the material quartz (Drawing 1 Item 2, Paragraph 21).

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imafuku (US 6,074,518) in view of Seta (JP 2000-036486).**

With respect to Claim 5: Imafuku discloses an apparatus in accordance with Claim 1. Imafuku does not expressly state that the magnet is an electromagnet.

Seta discloses an apparatus in accordance with claim 1, wherein the magnet is an electromagnet. Imafuku and Seta are analogous art because they are from the same field of endeavor, namely magnetic rings used in plasma processing.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the magnetic ring of Imafuku including the magnet is an electromagnet in view of the teaching of Seta. The suggestion or motivation would have been to provide a means of controlling the magnetic field generated by the magnet (Drawing 2 Item 21, Paragraph 21).

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With respect to Claim 7: Imafuku discloses an apparatus in accordance with Claim 1. Imafuku does not expressly state that the structure is of a material selected from the group consisting of quartz, silicon,  $Y_2O_3$ , silicon carbide and  $Al_2O_3$ . Seta discloses an apparatus in accordance with claim 1, wherein the structure is of a material selected from quartz (Paragraph 21).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the magnetic ring of Imafuku including the structure is of a material selected from quartz in view of the teaching of Seta. The suggestion or motivation would have been to provide a material to the structure that is resistant to corrosion. As required by Imafuku but not disclosed.

### **Conclusion**

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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Art Unit 1763